IN THE CLAIMS

Please amend Claims 1-2, 4, 7, 13, 19, 33 and 59 as follows:

1. (Currently amended) A method for summing integrals at a target frequency ~~of a plurality of target frequencies~~, the method comprising the steps of:

accessing a set of pairs of I and Q correlation values corresponding to a set of data blocks, wherein:

the set of data blocks together make up a sampled data that is associated with a received signal; and

each pair of I and Q correlation values from the set of pairs of I and Q correlation values corresponds to a calculated pair of I and Q correlation integrals that are integrated over one corresponding data block from the set of data blocks at a plurality of frequencies from a set of frequencies;

selecting pairs of I and Q correlation values that correspond to the calculated pairs of I and Q correlation integrals that are calculated using a selected frequency from the set of frequencies that is close to the target frequency to be the selected pairs I and Q correlation values;

weighting the selected pairs of I and Q correlation values according to a difference between the target frequency and the selected frequency ~~a set of characteristics~~ to produce a set of weighted pairs of I and Q correlation values; and

summing the weighted pairs of I and Q correlation values ~~at the target frequency~~.

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2. (Currently amended) A method for summing integrals for [a] sampled data <u>of a signal</u>, the method comprising the steps of:

step A: defining R number of sets of frequencies, wherein:

R is an integer value that is greater than unity; and

each set of frequencies from the R number of sets of frequencies is assigned an index that is unique, wherein the index ranges in value from 1 to R;

step B: defining R number of sets of data blocks, wherein:

each set of data blocks from the R number of sets of data blocks make up the sampled data; and

each set of data blocks from the R number of sets of data blocks is assigned the index that is unique, wherein the index ranges in value from 1 to R;

step C: defining R number of pairs of data block-frequency sets, wherein:

each pair of data block-frequency sets from the R number of pairs of data block-frequency sets is assigned the index that is unique, wherein the index ranges in value from 1 to R; and

each pair of data block-frequency sets comprises a set of data blocks from the R number of sets of data blocks and a set of frequencies from the R number of sets of frequencies, wherein: the index of the pair of data block-frequency sets, the index of the set of data blocks in the pair of data block-

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frequency sets and the index of the set of frequencies in the pair of data block-frequency sets have identical values;

step D: selecting a first pair of data block-frequency sets, wherein the index of the first pair of data block-frequency sets is equal to 1;

step E: for each data block in the first pair of data block-frequency sets, calculating a pair of I and Q correlation integrals at each frequency in the first pair of data block-frequency sets to produce a corresponding pair of I and Q correlation values;

step F: selecting a next pair of data block-frequency sets to be a current pair of data block-frequency sets, wherein:

the next pair of data block-frequency sets has not been previously selected; and

the index of the next pair of data block-frequency sets is a next lowest index;

step G: from the current pair of data block-frequency sets, selecting one data block that has not been previously selected from the current pair of data block-frequency sets to be the selected data block and performing the steps of:

step H: identifying a previously selected pair of data block-frequency sets that contains a subset of data blocks to be an identified pair of data block-frequency sets, wherein the subset of data blocks make up the selected data block;

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step I: selecting a frequency that has not been previously selected from the current pair of data block-frequency sets to be a target frequency;

step J: from the identified pair of data block-frequency sets, identifying a frequency that is close in value to the target frequency to be an identified frequency;

step K: selecting pairs of I and Q correlation values that correspond to the subset of data blocks at the identified frequency to be the selected pairs of I and Q correlation values;

step L: for the selected data block, weighting the selected pairs of I and Q correlation values with weights to form the weighted pairs of I and Q values;

step M: summing the weighted pairs of I and Q values over the selected data block to form weighted sums of I and Q values; and

step N: repeating steps I through N until all the frequencies from the current pair of data block-frequency sets have been selected to be the target frequency;

step O: repeating steps G through O until all the data blocks from the current pair of data block-frequency sets have been selected to be the selected data block; and

step P: repeating steps F through O until all the pairs of data block-frequency sets from the R number of pairs of data block-frequency sets have been selected to be the current pair of data block-frequency sets.

3. (Previously presented) The method of claim 2, wherein the step of calculating

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a pair of I and Q correlation integrals is performed coherently using a navigation bit information when the pair of I and Q correlation integrals is associated with a received signal that emanated from a global positioning satellite vehicle, and wherein the navigation bit information is associated with the global positioning satellite vehicle.

4. (Currently amended) A method for summing integrals for [a] sampled data <u>of a signal</u>, the method comprising the steps of:

step A: defining a first set of frequencies and a second set of frequencies;

step B: defining a first set of data blocks and a second set of data blocks, wherein; each set of data blocks make up the sampled data;

step C: defining a first pair of data block-frequency set, wherein: the first pair of data block-frequency set comprises the first set of data blocks and the first set of frequencies;

step D: defining a second pair of data block-frequency set, wherein: the second pair of data block-frequency set comprises the second set of data blocks and the second set of frequencies;

step E: selecting the first pair of data block-frequency set;

step F: for each data block in the first pair of data block-frequency sets, calculating a pair of I and Q correlation integrals at each frequency in the first pair of data block-frequency sets to produce a corresponding pair of I and Q correlation values;

step G: from the second pair of data block-frequency set, selecting one data

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block that has not been previously selected from the second pair of data block-frequency sets to be a selected data block and performing the steps of:

step H: from the first pair of data block-frequency set, identifying a subset of data blocks that make up the selected data block;

step I: selecting a frequency that has not been previously selected from the second pair of data block-frequency set to be a target frequency;

step J: from the first pair of data block-frequency set, identifying a frequency that is close in value to the target frequency to be an identified frequency;

step K: selecting pairs of I and Q correlation values that correspond to the subset of data blocks from the first pair of data block-frequency set to be the selected pairs of I and Q correlation values;

step L: for the selected data block, weighting the selected pairs of I and Q correlation values with weights to form weighted pairs of I and Q values;

step M: summing the weighted pairs of I and Q values over the selected data block to form weighted sums of I and Q values; and

step N: repeating steps I through N until all the frequencies from the current pair of data block-frequency sets have been selected to be the target frequency; and

step O: repeating steps G through O until all the data blocks from the second pair of data block-frequency set have been selected to be the selected data block.

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5. (Previously presented) The method of claim 4, wherein the step of calculating a pair of I and Q correlation integrals is performed coherently by using a navigation bit information when the pair of I and Q correlation integrals is associated with a received signal that emanated from a global positioning satellite vehicle, and wherein the navigation bit information is associated with the global positioning satellite vehicle.

6. (Previously presented) The method of claim 4, wherein the step of calculating a pair of I and Q correlation integrals is performed coherently using a navigation bit information when the pair of I and Q correlation integrals is associated with a received signal that emanated from a global positioning satellite vehicle, and wherein the navigation bit information is associated with the global positioning satellite vehicle.

7. (Currently amended) A method for estimating a carrier frequency at a target frequency, the method comprising the steps of:

receiving sampled data associated with a received signal;

dividing a range of frequency of interest into a first set of frequency intervals and a second set of frequency intervals;

dividing the sampled data into a set of data blocks based on the first set of frequency intervals;

for each data block of the set of blocks of data, calculating I and Q correlation integrals associated with the sampled data at one representative frequency from each frequency interval in the first set of frequency intervals;

for every frequency interval of the second set of frequency intervals, determining a selected frequency in the first set of frequency intervals, wherein the

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selected frequency is close in value to the target frequency;

selecting I and Q correlation integrals corresponding to each selected frequency to be a selected pair of I and Q correlation values;

weighting the selected pairs of I and Q correlation values according to a difference between the selected frequency and the target frequency ~~a set of characteristics~~ to produce a set of weighted pairs of I and Q correlation values; ~~and~~

summing the weighted pairs of I and Q correlation values ~~at the target frequency~~ to form summed weighted pairs of I and Q correlation values; and

estimating the carrier frequency from the summed weighted pairs of I and Q correlation values.

8. (Original) The method of claim 7, wherein the received signal is from a known signal source.

9. (Original) The method of claim 7, wherein for each data block of the set of data blocks, the step of calculating I and Q correlation integrals comprises calculating the I and Q correlation integrals for each hypothesized delay value over a range of hypothesized delay values.

10. (Original) The method of claim 9, further comprising the step of selecting a trial frequency value for each frequency interval of the first set of frequency intervals for calculating the I and Q correlation integrals.

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11. (Original) The method of claim 10, wherein the trial frequency value is a frequency value at a mid-point of each frequency interval.

12. (Original) The method of claim 7, wherein the carrier frequency contains at least one frequency shift that is a member of a set of frequency shifts, wherein the set of frequency shifts include a zero frequency shift, a positive frequency shift and a negative frequency shift.

13. (Currently amended) The method of claim 7, ~~further comprising~~ wherein the estimating the carrier frequency step comprises the steps of:

for each hypothesized delay value in a range of hypothesized delay values, calculating a magnitude of a vector (I,Q) of correlation sums that were previously summed over all the blocks of data for each frequency interval of the second set of frequency intervals; and

determining an estimate of the carrier frequency by identifying a particular frequency interval from the second set of frequency interval that has a highest magnitude calculation.

14. (Original) The method of claim 7, wherein the first set of frequency intervals is a coarse grain set of frequency intervals and the second set of frequency intervals is a fine grain set of frequency intervals.

15. (Original) The method of claim 7, wherein a number of intervals in the first set of frequency intervals is proportional to a length of the sampled data and is based on a pre-selected signal-to-noise ratio.

16. (Original) The method of claim 7, wherein a number of intervals in the second set of frequency intervals is proportional to a length of the sampled data.

17. (Original) The method of claim 7, wherein a range of frequency of interest is

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based on a pre-selected frequency interval around a frequency of a known signal source from which the received signal emanates.

18. (Original) The method of claim 7, wherein calculating the I correlation integral and the Q correlation integral is performed coherently by using navigation bit information when the received signal emanates from a global positioning satellite vehicle, wherein the navigation bit information is associated with the global positioning satellite vehicle.

19. (Previously presented) A method for summing I and Q correlation integrals at a target frequency, the method comprising the steps of:

accessing a set of pairs of I and Q correlation values corresponding to a set of data blocks and a set of frequencies, wherein:

the data blocks in the set of data blocks together make up a set of data that is associated with a received signal; and

each pair of I and Q correlation values from the set of pairs of I and Q correlation values corresponds to a calculated pair of I and Q correlation integrals that are calculated over one corresponding data block from the set of data blocks at one corresponding frequency from the set of frequencies;

selecting pairs of I and Q correlation values that correspond to calculated pairs of I and Q correlation integrals that are calculated at a frequency from the set of frequencies that is close to the target frequency to be the selected pairs of I and Q correlation values;

selecting weights for each selected pair of I and Q correlation values, based on the difference of the target frequency from the frequency at which the selected pairs

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of I and Q correlation values are calculated, and also based on the position of the data block that corresponds to the selected pair of I and Q correlation values;

weighting the selected pairs of I and Q correlation values according to the selected weights to produce a set of weighted pairs of I and Q correlation values; and

summing the weighted pairs of I and Q correlation values.

20. (Previously presented) The method of Claim 19 wherein all of the data blocks comprising the set of data blocks have the same length.

21. (Previously presented) The method of Claim 20 wherein the length of the data blocks comprising the set of data blocks is chosen to minimize a measure of computational complexity.

22. (Previously presented) The method of Claim 19 wherein the set of data that is associated with the received signal comprises sampled data obtained by sampling the received signal.

23. (Previously presented) The method of Claim 22 wherein the received signal is a GPS signal.

24. (Previously presented) The method of Claim 19 wherein the set of data that is associated with the received signal is an analog signal.

25. (Previously presented) The method of Claim 24 wherein the received signal is a GPS signal.

26. (Previously presented) The method of Claim 19 wherein the received signal is a GPS signal.

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27. (Previously presented) The method of Claim 26 wherein the calculated pair of I and Q correlation integrals are integrated coherently based on navigation bit information associated with a global positioning satellite vehicle.

28. (Previously presented) The method of Claim 26 wherein the target frequency is determined on the basis of an intermediate frequency employed by a receiver and a Doppler shift associated with a global positioning satellite vehicle.

29. (Previously presented) The method of Claim 19, wherein for each data block in the set of data blocks, the calculated pair of I and Q correlation integrals are calculated for each hypothesized delay value over a range of hypothesized delay values.

30. (Previously presented) The method of Claim 29 wherein the received signal is a GPS signal.

31. (Previously presented) The method of Claim 19, wherein the number of data blocks is proportional to a length of the received signal.

32. (Previously presented) The method of Claim 31 wherein the received signal is a GPS signal.

33. (Currently amended) A method for estimating a carrier frequency, the method comprising the steps of:

Step A: Defining R levels, indexed by consecutive integers 1 to R, wherein

each level r is associated with a set of data blocks that together make up a set of data that is associated with a received signal;

each data block in the set of data blocks associated with a level r, where

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r is greater than 1, is made up from data blocks from the set of data blocks associated with level r-1;

the set of data blocks associated with the level R comprises a single data block;

each level r is associated with a set of frequencies; and

the set of frequencies associated with the level R comprises a set of candidate frequencies;

Step B: for each data block in the set of data blocks associated with the first level, calculating at each frequency in the set of frequencies associated with the first level, a pair of I and Q integrals to produce corresponding pairs of I and Q correlation values;

Step C: selecting level 2 to be a current level and selecting level 1 to be a previous level;

Step D0: selecting a data block in the set of data blocks associated with the current level that has not been previously selected to be a selected data block;

Step Dl: selecting a set of constituent data blocks from the set of data blocks associated with the previous level that make up the selected data block to be a selected set of constituent data blocks;

Step D2: selecting a frequency from the set of frequencies associated with the current level to be a selected frequency;

Step D3: selecting the pairs of I and Q correlation values corresponding to each

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data block in the selected set of constituent data blocks and corresponding to a frequency associated with the previous level which is close to the selected frequency, to be the selected pairs of I and Q correlation values;

Step D4: selecting weights for the selected pairs of I and Q correlation values, based on a difference between ~~the~~ a target frequency and the frequency at which the selected pairs of I and Q correlation values are calculated, and also based on the position of the data block that corresponds to the selected pair of I and Q correlation values;

Step D5: weighting the selected pairs of I and Q correlation values according to the selected weights to produce a set of weighted pairs of I and Q correlation values corresponding to the selected data block and the selected frequency;

Step D6: summing the weighted pairs of I and Q correlation values to produce a pair of I and Q correlation values associated with the current level, selected data block, and the selected frequency;

Step D7: repeating steps D2-D6 until every frequency from the set of frequencies associated with the current level has been selected to be the selected frequency; and

Step D8: repeating steps D0-D7 until every data block in the set of data blocks associated with the current level has been selected to be the selected data block;

Step E: If the current level r is not level R, updating the current level to be level r+1, updating the previous level to be level r, and repeating steps D0-E; and

Step F: Estimating the carrier frequency on the basis of the pairs of I and Q

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correlation values associated with level R and with the frequencies in the set of candidate frequencies.

34. (Previously presented) The method of Claim 33 wherein Step F comprises the steps of:

Step F1: for each frequency in the set of candidate frequencies, calculating a magnitude associated with the corresponding pair of I and Q correlation values; and

Step F2: estimating a carrier frequency by selecting a frequency in the set of candidate frequencies for which the associated magnitude is largest.

35. (Previously presented) The method of Claim 34 wherein the received signal is a GPS signal.

36. (Previously presented) The method of Claim 34 wherein the maximum magnitude is compared against a threshold.

37. (Previously presented) The method of Claim 36 wherein the received signal is a GPS signal.

38. (Previously presented) The method of Claim 33 wherein the set of data that is associated with the received signal comprises sampled data obtained by sampling the received signal.

39. (Previously presented) The method of Claim 38 wherein the received signal is a GPS signal.

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40. (Previously presented) The method of Claim 33 wherein the set of data that is associated with the received signal is an analog signal.

41. (Previously presented) The method of Claim 40 wherein the received signal is a GPS signal.

42. (Previously presented) The method of Claim 33 wherein the received signal is a GPS signal.

43. (Previously presented) The method of Claim 42 wherein the step of calculating the pair of I and Q correlation integrals is performed coherently based on navigation bit information associated with a global positioning satellite vehicle.

44. (Previously presented) The method of Claim 42 wherein the set of candidate frequencies is determined on the basis of an intermediate frequency employed by a receiver and a Doppler shift associated with a global positioning satellite vehicle.

45. (Previously presented) The method of Claim 33, wherein the steps B-E are repeated for each hypothesized delay value over a range of hypothesized delay values, to produce a pair of I and Q correlation values corresponding to each candidate frequency and each hypothesized delay value.

46. (Previously presented) The method of Claim 45 wherein the received signal is a GPS signal.

47. (Previously presented) The method of Claim 45, wherein the step of estimating the carrier frequency comprises the steps of:

for each candidate frequency within the set of candidate frequencies and for each hypothesized delay in the range of hypothesized delay values, calculating a magnitude associated with the corresponding pair of I and Q correlation values; and

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selecting the hypothesized delay value and candidate frequency that has the highest magnitude calculation.

48. (Previously presented) The method of Claim 47 wherein the received signal is a GPS signal.

49. (Previously presented) The method of Claim 47 wherein the maximum magnitude is compared against a threshold.

50. (Previously presented) The method of Claim 49 wherein the received signal is a GPS signal.

51. (Previously presented) The method of Claim 33, wherein the number R of levels equals 2.

52. (Previously presented) The method of Claim 51 wherein the received signal is a GPS signal.

53. (Previously presented) The method of Claim 33, wherein the number of data blocks iii the set of data blocks associated with each level is proportional to a length of the received signal.

54. (Previously presented) The method of Claim 53 wherein the received signal is a GPS signal.

55. (Previously presented) The method of Claim 33, wherein every data in the set of data blocks associated with the same level has the same length.

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56. (Previously presented) The method of Claim 55 wherein the received signal is a GPS signal.

57. (Previously presented) The method of Claim 55, wherein the number of frequencies in the set of frequencies associated with a level is proportional to the length of the data blocks associated with the level.

58. (Previously presented) The method of Claim 57 wherein the received signal is a GPS signal.

59. (Currently amended) A method for estimating a carrier frequency, the method comprising the steps of:

receiving data associated with a received signal;

determining a frequency range of interest;

determining a set of coarse frequencies within the frequency range of interest;

determining a set of fine frequencies within the frequency range of interest;

dividing the data into a set of data blocks;

for each data block of the set of data blocks, calculating I and Q correlation values associated with the data at each frequency from the set of coarse frequencies;

for every frequency of the set of fine frequencies, determining a selected frequency in the set of coarse frequencies, wherein the selected frequency is close in value to the frequency in the set of fine frequencies;

for each data block of the set of data blocks, selecting I and Q correlation values corresponding to each coarse frequency to be the selected I and Q correlation values for the corresponding data block and coarse frequency;

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selecting weights for the selected I and Q correlation values, based on a difference between ~~a~~ the frequency in the set of fine frequencies and the corresponding selected frequency in the set of coarse frequencies, and also based on a position of the data block that corresponds to the selected pair of I and Q correlation values;

weighting the selected pairs of I and Q correlation values according to the selected weights to produce weighted pairs of I and Q correlation values;

computing an approximation to the I and Q correlation integrals over the entire data associated with the received signal, for each frequency in the set of fine frequencies, using the corresponding weighted pairs of I and Q correlation values; and

estimating the carrier frequency from within the set of fine frequencies by using the approximations to the I and Q correlation integrals ~~at the frequencies in the set of fine frequencies~~.

60. (Previously presented) The method of Claim 59 wherein all of the data blocks comprising the set of data blocks have the same length.

61. (Previously presented) The method of Claim 59 wherein the length of the data blocks comprising the set of data blocks is chosen to minimize a measure of computational complexity.

62. (Previously presented) The method of Claim 59 wherein the set of data that is associated with the received signal comprises sampled data obtained by sampling the received signal.

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63. (Previously presented) The method of Claim 62 wherein the received signal is a GPS signal.

64. (Previously presented) The method of Claim 59 wherein the set of data that is associated with the received signal is an analog signal.

65. (Previously presented) The method of Claim 64 wherein the received signal is a GPS signal.

66. (Previously presented) The method of Claim 59 wherein the received signal is a GPS signal.

67. (Previously presented) The method of Claim 66 wherein calculating I and Q correlation values is performed coherently based on navigation bit information associated with a global positioning satellite vehicle.

68. (Previously presented) The method of Claim 66 wherein the set of fine frequencies is determined on the basis of an intermediate frequency employed by ~~the~~ a receiver and a Doppler shift associated with a global positioning satellite vehicle.

69. (Previously presented) The method of Claim 66 wherein the set of coarse frequencies is determined on the basis of an intermediate frequency employed by ~~the~~ a receiver and a Doppler shift associated with a global positioning satellite vehicle.

70. (Previously presented) The method of Claim 59, wherein the number of data blocks in the set of data blocks is proportional to a length of the received signal.

71. (Previously presented) The method of Claim 70 wherein the received signal is a GPS signal.

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72. (Previously presented) The method of Claim 60, wherein the number of coarse frequencies is proportional to the length of the data blocks.

73. (Previously presented) The method of Claim 72 wherein the received signal is a GPS signal.

74. (Previously presented) The method of Claim 59, wherein the number of fine frequencies is proportional to the length of the data associated with the received signal.

75. (Previously presented) The method of Claim 74 wherein the received signal is a GPS signal.

76. (Previously presented) The method of Claim 59, wherein the step of computing the approximation to the I and Q correlation integrals comprises the steps of:

Step A: zero-padding the weighted pairs of I and Q correlation values;

Step B: applying a Fast Fourier Transform on the zero-padded weighted pairs of I and Q correlation values; and

Step C: selecting the values of the Fast Fourier transform at appropriate frequencies to be the approximations to the I and Q correlation integrals at the frequencies in the set of fine frequencies.

77. (Previously presented) The method of Claim 76 wherein the received signal is a GPS signal.

78. (Previously presented) The method of Claim 76 wherein a number of zeros introduced during Step A is determined by a frequency resolution associated with the set of fine frequencies.

79. (Previously presented) The method of Claim 78 wherein the received signal is a GPS signal.

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80. (Previously presented) The method of Claim 59, wherein for each data block in the set of data blocks, the step of calculating I and Q correlation values comprises calculating the I and Q correlation values for each hypothesized delay value over a range of hypothesized delay values.

81. (Previously presented) The method of Claim 80 wherein the received signal is a GPS signal.

82. (Previously presented) The method of Claim 76, wherein the Steps A, B, and C are carried out for each hypothesized delay value over a range of hypothesized delay values.

83. (Previously presented) The method of Claim 84 wherein the received signal is a GPS signal.

84. (Previously presented) The method of Claim 82, wherein the step of estimating the carrier frequency from within the set of fine frequencies comprises the steps of:

calculating a magnitude of the approximations to the I and Q correlation integrals for each frequency within the set of fine frequencies and for each hypothesized delay; and

selecting the hypothesized delay and carrier frequency that has the highest magnitude calculation.

85. (Previously presented) The method of Claim 84 wherein the received signal is a GPS signal.

86. (Previously presented) The method of Claim 84 wherein the ~~maximum~~ highest magnitude is compared against a threshold.

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87. (Previously presented) The method of Claim 86 wherein the received signal is a GPS signal.

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